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Modelling the Office Rental Market in Selected Districts of Abuja, Nigeria

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Abstract
This study examined the drivers of office rents in selected districts of Abuja, Nigeria. These districts are Asokoro, Maitama and Utako. Primary and secondary data were utilized for the study. Primary data obtained for the study include office rental levels and office space data in the study area for the period, 2001-2012. Secondary data for the study were obtained from the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN) and are mainly macroeconomic variables in Nigeria for the period, 2001-2012. Using single - equation regression analysis, the office rent model developed accounted for 76%, 72% and 75% of the variation in office property rents in the commercial property market in Asokoro, Maitama and Utako districts respectively. The study also revealed that real GDP growth and vacancy rate are the major determinants of rental growth in the office property market in Asokoro and Maitama districts while real GDP growth is the major driver of office rents in Utako district. Also, Rental index for office properties in the study areas using 2001 as the base year indicates progressive upward movement in rental values of office properties in these districts within the study period.
Keywords: Office Rental Determinants; Office Property Market; Office Rent Model; Nigeria

INTRODUCTION

Rent is an important concept in land economic theory. Rental payments have been made for the use of land since the beginning of organised land settlement. These payments represent the economic return that goes to real estate resources for their use in production (Barlowe, 1986). In modern times, the genesis of rent has been traced to the rise in individual enterprises, rights and responsibilities as a result of the fall of feudalism. In the days of feudalism, a rent relationship existed between the lord of the manor and his workers. These workers are those who worked on the land of the feudal lords. The rent relationship that existed during the feudal times was in the form of quit rents, customary dues paid in money and socage. In the feudal system, socage is a system of land holding, in which every tenant either pay rent or carry out fixed service, usually agricultural and nonmilitary in nature whereas quit rent is a rent in the feudal system paid by a tenant to a feudal lord in exchange for being released from some feudal obligations. In simple terms, rent is the economic return to land resources. It is also the value of land on annual basis (Ifediora, 2005). As a factor of production, classical economists over the years have attempted to analyse the economic concept of land, the role of land in the production process and the nature of land rent. They viewed rent as a price of land and a payment made by a tenant farmer to the landlord for the use of original and indestructible powers of the soil. This analysis was initially based on agricultural production and was gradually extended to other land uses.

Rent from land could also be viewed as an unearned monopoly return which land owners could claim because of the institution of private property. However, most investors and real property owners, in contrast, see rent as a return on the capital value of their real estate investments and compare these returns with those they could receive from alternative capital investments. On the other hand, tenants view rental payments as an operating cost (Barlowe, 1986).

LITERATURE REVIEW

The commercial property market is defined by some fundamental concepts. These concepts provide the basis for the determination of commercial property rental values. Archer and Ling (1997) established a three market framework, illustrating the relationships between the space market, the property market and the capital market. Thus, in the commercial property market, rental value is a function of space, property and capital market determinants**.** The composition of the individual characteristics of these three elements (space, property and capital) varies in the context of national, regional and local commercial property markets. Measuring commercial property rental patterns is important as it provides information to make a decision about investing and developing and can be used to predict the cyclical behaviour of commercial property development (Born and Phyrr, 1994). Rental growth forecast parameters are often incorporated into discounted cash flow models for property appraisals (Boon and Higgins, 2007). Most of the published literature on commercial property rental determinants is based on studies conducted in four geographical regions of the world. These include America, Europe, Asia and Australia (Yusof, 2001; Chin, 2003; Boon and Higgins, 2007).

In searching through previous literature on the determinants of commercial property rental growth in African cities and particularly, Nigerian cities, not a single relevant research paper was found. Thus, the literature review on commercial property rental determinants is focused on the relevant studies conducted in America, Europe, Asia and Australia. These studies are based on two major classes of commercial properties, namely offices and shops. While majority of the studies are focused on office rental determinants, few are focused on shop or retail property rental determinants. Existing literature on rental determinants utilised in office rent models reviewed for this study is summarised in Table 1 as follows:

Table 1: Previous Studies and Office Rental Determinants Identified

Author(s)	Year	Geographical Area	Study Period	Data Analysis Method	Office Rental Determinants Identified
Hekman	1985	14 cities in the United States	1979-1983 (Annual)	Multi-Equation Regression Analysis	Gross National Product, employment rate, unemployment rate and vacancy rate.
Shilling, Sirmans and Corgel	1987	17 cities in the United States	1960-1975 (Annual)	Multi-Equation Regression Analysis	Non-manufacturing employment, population, vacancy rate, office floor stock and property tax.
Gardiner and Henneberry	1989	8 regions across United Kingdom	1977-1984 (Annual)	Single-Equation Regression Analysis	Regional Gross Domestic Product (GDP), unemployment rate, service sector employment, average regional income and office floor stock.
Glascock, Jahanian and Sirmans	1990	6 sub-markets in Baton Rouge, Louisiana, United States	1984-1988 (Annual)	Single-Equation Regression Analysis	Employment growth, vacancy rate, level of amenities, physical building attribute.
Wurtzebach, Mueller and Machi	1991	United States	1978-1990 (Quarterly)	Multi-Equation Regression Analysis	Expected inflation, unexpected inflation and vacancy rate.
Dobson and Goddard	1992	United Kingdom	1972-1987 (Annual)	Single-Equation Regression Analysis	Office employment rate, House Price Index and interest rates.

Table 1 Continued: Previous Studies and Office Rental Determinants Identified

Author(s)	Year	Geographical Area	Study Period	Data Analysis Method	Office Rental Determinants Identified
Hendershott	1995	Sydney, Australia	1970-1992 (Annual)	Single-Equation Regression Analysis	Vacancy rate, replacement cost and building. depreciation rate.
D'Arcy, McGough and Tsolacos	1997b	22 European cities	1982-1994 (Annual)	Single-Equation Regression Analysis	Gross Domestic Product (GDP) and interest rates.
Sivitanides	1997	19 major office markets across United States	1980-1988 (Bi-Annual)	Single-Equation Regression Analysis	Service sector employment, vacancy rate, absorption rate, office completion and vacancy changes.
Hendershott, Lizieri and Matysiak	1998	City of London, United Kingdom	1976-1996 (Annual)	Multi-Equation Regression Analysis	Office employment, vacancy rate, office floor stock and real interest rates
McGough and Tsolacos	1999	United Kingdom	1980-1998 (Quarterly)	Multi-Equation Regression Analysis	Service sector employment, Real Gross Domestic Product (GDP), past rents and new construction.
D'Arcy, McGough and Tsolacos	1999	Dublin, Ireland	1970-1997 (Annual)	Single-Equation Regression Analysis	Real Gross Domestic Product (GDP), service sector employment, office floor stock and new office construction.
MacFarlane and Moon	1999	Sydney and Melbourne, Australia	1970-1997 (Annual)	Multi-Equation Regression Analysis	Unemployment rate, changes in office floor space, vacancy and absorption
Yusof	2001	Kuala Lumpur, Malaysia	1980-1999 (Annual)	Single-Equation Regression Analysis	Changes in unemployment level and average occupancy rate.

Table 1 Continued: Previous Studies and Office Rental Determinants Identified

Author(s)	Year	Geographical Area	Study Period	Data Analysis Method	Office Rental Determinants Identified
Matysiak and Tsolacos	2003	United Kingdom	1987-2001 (Quarterly)	Multi-Equation Regression Analysis	Volume of retail sales, job vacancies, consumer confidence, new construction orders, interest rates, narrow money supply, broad money supply and share price index.
Chin	2003	South-East Asian cities of Singapore, Hong Kong, Taipei, Kuala Lumpur, and Bangkok	1988-2001 (Annual)	Single-Equation Regression Analysis	Gross Domestic Product (GDP), unemployment rate, Consumer Price Index, service sector output, available floor stock and prime lending rate.
De Wit and Van Dijk	2003	46 locations in Asia, Europe and United States	1986-1999 (Annual)	Single-Equation Regression Analysis	Gross Domestic Product (GDP), unemployment rate, level of inflation, office floor stock and vacancy rate.
Hui and Yu	2006	Central District of Hong Kong, South-East Asia	1990-2004 (Quarterly)	Single-Equation Regression Analysis with system dynamics modelling	Vacancy rate, Finance, Insurance and Real Estate (FIRE) unemployment rate, Gross Domestic Product (GDP), change in Consumer Price Index (CPI), FIRE Real Wage Index.
Boon and Higgins	2007	Central Region of Singapore, South-East Asia	1992-2005 (Quarterly)	Single-Equation Regression Analysis	Changes in previous year vacancy rates, construction costs, prime lending rates and office sector employment rates.

OFFICE PROPERTY RENT MODELS

Many property researchers and academics have developed a range of mathematical models for the purpose of forecasting rental trend in the commercial property market. Most of these models have been utilized in predicting office property rental trend (Tonelli et al, 2004; Boon and Higgins, 2007). Existing literature reviewed for the study reveals that models already developed by researchers for office rental growth forecasting are either single equation model or multi – equation model.

The single equation model is based on the premise that property, economic and financial variables are used to capture the interaction within the demand and supply framework (Gardiner and Henneberry, 1989; Glascock et al, 1990; Sliver and Goode, 1990; Sirmans and Guidry, 1992; Dobson and Goddard, 1992; Giussani *et al*, 1993; D'Arcy *et al*, 1997, 1999; Dewit and Van Dijk, 2003; Chin, 2003; Colwell and Jackson, 2004; Boon and Higgins, 2007). The single equation model is also based on the assumption that rent is to be a linear function of a series of independent variables. Such a model could help explain the historical variation in rental values (dependent variable) and predict rental trend in the future (Boon and Higgins, 2007).

The multi – equation model comprises two or more equations which incorporate endogenous and exogenous variables which are used to model rental change, development markets and space demand changes (Chin, 2003). Rosen (1984); Hekman (1985); Shilling et al (1987); Hendershott *et al* (1998); McGough and Tsolacos (1999); Parker *et al* (2003); Tonelli *et al* (2004) have used the multi – equation model to predict commercial property rental growth over a given timeframe.

However, although using multiple equations has the ability to capture the dynamics of the property market more effectively than the single equation model because it integrates the influence of the exogenous variables and allows an interaction between them and the endogenous variables within the system (McGough and Tsolacos,

1999), such theoretically based models have been found by Stevenson and McGarth (2003) to limit the flexibility in modelling particularly when used for forecasting purposes.

METHODOLOGY AND DATA

This study utilised primary and secondary data. The primary data basically comprise rental data of office properties in Asokoro, Maitama and Utako districts of Abuja, Nigeria. These include annual data on rental levels for office properties under study for the period, 2001 – 2012 and their specific characteristics, occupancy levels and property floor stock. Secondary data for the study are mainly data on macro-economic indices in Nigeria for the period, 2001 – 2012. The annual statistical bulletins of the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN) were surveyed to extract relevant data on macro-economic indices in Nigeria for the period 2001 – 2012. These macro-economic indices are inflation rate, interest rate on real estate loans, interest rate on commerce, Monetary Policy Rate (MPR), Gross Development Product (GDP), Unemployment rate, and Employment Rate. Based on the aim of the study, only commercial investment properties were selected for data collection for the study as they constitute the only class of commercial properties which rents are paid to occupy them and such rents undergo changes in form of rental adjustment or rental growth. These properties are mainly office properties in the study areas. The rental data were obtained from estate surveying and valuation firms which are active in the commercial property market in the city of Abuja. Using systematic random sampling technique, 77 office properties were selected from a total of 118 office properties which have required data in the study areas. Office property rents used for the study were standardized relative to their superficial floor areas. This standardization limited the quantum of office property rental data for the study as rental data on office properties which could not be accessed to determine their superficial floor areas were eliminated. Also, there were some gaps in the available data on rents paid by property occupiers on office properties in the study areas in the past 10 years. This is because the estate surveying and valuation firms which were respondents to the questionnaire were not in charge of management of the properties during the period and as such had no knowledge of the rents that were paid. Attempt was made to close these gaps by determining weighted rent for office properties in each district for each of the years under study.

RESULTS AND DISCUSSION

Rental index was constructed based on the weighted rent/m^2 of office properties in the commercial property market selected for the study using 2001 as the base year as presented in Table 3. The result of rental index analysis for office properties in the various commercial property markets in the study areas indicates upward trend in rental values of office properties in the selected districts within the study period. Annual rental growth rates were determined for the properties under study for the period, 2001 – 2012. The annual rental growth rates were determined based on the rental growth factor for office properties for each year under study. The rental growth factor for office properties in Asokoro, Maitama and Utako for the period, 2001-2012 is 1.0835 – 1.1019. This represents an average rental growth rate of 8.35% - 10.19% for the study period as presented in Table 2.

Table 2: Office Rental Change, Rental Growth Factor and Average Rental Growth Rate for Office Properties in the Study Areas, 2001 - 2012

Commercial Property Market	Rental Change	Slope	Rental Growth Factor	Average Rental Growth Rate (%) (2001-2012)
Asokoro	0.9916	0.0901	1.0943	9.43
Maitama	1.06715	0.0970	1.1019	10.19
Utako	0.882597	0.0802	1.0835	8.35

Table 3: Rental Index for Office Properties in the Study Areas, 2001 - 2012

Commercial Property Market	Office Rental Index					
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Asokoro	100	104.77	108.85	115.04	128.46	163.69
Maitama	100	119.27	135.55	135.97	142.75	182.25
Utako	100	115.20	125.86	141.80	144.37	156.01
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Asokoro	180.27	200.66	213.90	230.26	246.13	269.56
Maitama	182.74	203.12	222.14	225.87	242.63	290.71
Utako	166.23	176.66	180.45	192.46	198.80	241.72

Vacancy rates for office properties in the study areas for the period, 2001-2012 were determined as presented in Table 4. This was based on the office space data for the study areas.

Table 4: Office Vacancy Rates in the Study Areas, 2001 – 2012

Commercial Property Market	Office Vacancy Rates					
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Asokoro	46.65	38.62	32.93	28.31	24.07	18.51
Maitama	28.7	23.65	34.89	23.18	26.79	23.63
Utako	28.86	36.48	38.87	29.11	23.93	24.85
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Asokoro	14.71	13.05	11.26	9.05	6.48	4.03
Maitama	17.44	16.06	14.07	11.98	11.46	9.87
Utako	21.68	20.3	18.87	17.86	16.31	11.99

Macroeconomic data collected for the study were based on the macroeconomic variables identified from the existing literature reviewed for the study. These variables include interest rate on general commerce, interest rate on real estate loans, inflation rate, monetary policy rate, unemployment rate, exchange rate, real GDP growth rate and change in employment level. The Augmented Dicker Fuller (ADF) unit root test was carried out on all the data series to examine the extent of their stationarity. The ADF result is presented in Table 5.

Table 5: Result of Stationarity Test for Data Series utilised for the study

Variable	Computed ADF Statistic	Critical ADF Statistic at $\alpha = 0.05$
Δ Office Vacancy Rate(Asokoro)	-4.9266	-1.9755
Δ Δ Office Rent(Asokoro)	-3.8878	-1.9835
Δ Office Vacancy Rate(Maitama)	-4.5356	-1.9791
Δ Δ Office Rent(Maitama)	-4.4107	-1.9835
Δ Δ Office Vacancy Rate(Utako)	-2.7061	-1.9835
Δ Δ Office Rent(Utako)	-4.7253	-1.9835
Δ Interest Rate on General Commerce	-6.000	-1.9791
Δ Interest Rate on Real Estate Loans	-5.8631	-1.9791
Δ Inflation Rate	-5.4785	-1.9791
Δ Monetary Policy Rate	-2.8953	-1.9791
Δ Unemployment Rate	-4.9116	-1.9791
Δ Exchange Rate	-3.1905	-1.9791
Δ Real GDP Growth Rate	-4.4665	-1.9791
Δ Employment Level	-6.4692	-1.9791

The computed ADF statistics are less than the critical value at 0.05 level as presented in Table 5. The implication of this is that, the time series data on the variables utilised for the study are suitable for regression analysis. Also, based on the stationary nature of the time series data utilised for the study, Granger causality test was applied to the data to assess the causal linkage between the explanatory variables explored for the study and office rental movements in the commercial property market under study. The result of the Granger causality test revealed that among all the explanatory variables explored for the study, only real GDP growth, vacancy rate and inflation rate were found to have statistically significant causal linkage to office rental movements in the study areas and as such Granger cause office rental movements in the office property market in the area. Consequently, explanatory variables with no statistically significant causal linkage were dropped while those with statistically significant causal linkage were utilised to develop regression model for office property rents in the commercial property markets under study. The regression analysis was based on the theoretical framework of the commercial property rent equation in which commercial property rent is assumed to be a linear function of demand and supply factors in the commercial property market. The results of the regression analysis are presented in Table 6.

Table 6: Results of the Regression Analysis

Commercial Property Market	Term	Coefficient	t - Statistics	p - Value	Tolerance	VIF	R^2	SE	DW-Statistic
Asokoro	Intercept	4.748	23.68	<0.0001			0.76	0.20757	1.14
	ΔINR_{t-2}	0.004512	0.05	0.9599	0.4902	2.0400			
	$\Delta RGDP_{t-1}$	0.6146	3.70	0.0060	0.4188	2.3878			
	$\Delta VACR_{t-1}$	-0.2414	-3.43	0.0089	0.7342	1.3620			
Maitama	Intercept	4.723	24.23	<0.0001			0.72	0.20114	1.21
	ΔINR_{t-2}	0.01918	0.23	0.8256	0.4903	2.0396			
	$\Delta RGDP_{t-1}$	0.6323	3.43	0.0090	0.3185	3.1397			
	$\Delta VACR_{t-1}$	-0.2232	-2.36	0.0457	0.4752	2.1044			
Utako	Intercept	4.67	32.41	<0.0001			0.75	0.14648	1.11
	ΔINR_{t-2}	0.04603	0.74	0.4788	0.4806	2.0807			
	$\Delta RGDP_{t-1}$	0.4625	3.48	0.0083	0.3262	3.0656			
	$\Delta VACR_{t-1}$	-0.1521	-2.15	0.0637	0.4237	2.3602			

For Asokoro, the Durbin-Watson Statistic for the model is 1.14. This is above its critical value at 0.05 level (0.658) and shows that residual serial correlation was not statistically significant in the model. Again, the collinearity statistics, that is, tolerance and Variance Inflation Factor (VIF) are within acceptable statistical limits. This implies that the predictor variables for the model have no problem of multicollinearity. Also, 76% variation in office property rents in the commercial property market in Asokoro is explained by the model. In addition, real GDP growth and vacancy rate are the significant drivers of rental change in the commercial property market in Asokoro. Although inflation rate Granger causes office rental movements in the area within the period under study, again its influence in predicting office property rents in the area is insignificant. Thus, a unit increase in real GDP growth will produce 0. 6146 increase in office rents in Asokoro while a unit increase in vacancy rate will produce 0.2414 decrease in office rents in the area. Also, a unit increase in inflation will produce 0.004512 increase in office rents in the commercial property market in Asokoro.

For Maitama, the Durbin-Watson Statistic for the model is 1.21. This exceeds its critical value at 0.05 level (0.658) and shows that residual serial correlation was not statistically significant in the model. Again, the collinearity statistics, that is, tolerance and Variance Inflation Factor (VIF) are within acceptable statistical limits. This implies that the predictor variables for the model have no problem of multicollinearity. Also, 72% variation in office property rents in the commercial property market in Maitama is explained by the model. In addition, real GDP growth and vacancy rate are the significant drivers of rental change in the commercial property market in Maitama. Although inflation rate Granger causes office rental movements in the area within the period under study, again its influence in predicting office property rents in the area is insignificant. Thus, a unit increase in real GDP growth will produce 0. 6323 increase in office rents in Maitama while a unit increase in vacancy rate will produce 0.2232 decrease in office rents in the area. Also, a unit increase in inflation will produce 0.01918 increase in office rents in the commercial property market in Maitama.

For Utako, the Durbin-Watson Statistic for the model is 1.11. This exceeds its critical value at 0.05 level (0.658) and indicates that residual serial correlation was not statistically significant in the model. Again, the collinearity statistics, that is, tolerance and Variance Inflation Factor (VIF) are within acceptable statistical limits. This implies that the predictor variables for the model have no problem of multicollinearity. Also, 75% variation in office property rents in the commercial property market in Utako is explained by the model. Furthermore, real GDP growth is the significant driver of rental change in the commercial property market in Utako. Although vacancy rate and inflation rate Granger cause office rental movements in the area within the period under study, again their influence in predicting office property rents in the area is insignificant. Thus, a unit increase in real GDP growth will produce 0. 4625 increase in office rents in Utako while a unit increase in vacancy rate will produce 0.1521 decrease in office rents in the area. Also, a unit increase in inflation will produce 0.04603 increase in office rents in the commercial property market in Utako.

The significance of the regression models was tested using F-test. The computed F-statistic for the office rent model for office property rents in all the commercial property markets in the selected districts is significant at p-value less than 0.05 as presented in Table 7. This indicates that the office rent model for the districts under study fits the data utilised and as such can be used as a basis for prediction of office property rents in the commercial property market in the study areas.

Table 7: Results of the Test for the Statistical Significance of the Regression Models

Commercial Property Market	Source of Variation	Sum of Squares	DF	Mean Square	F-Statistic	p - Value
Asokoro	Model	1.09948	3	0.36649	8.51	0.0072
	Residual	0.34467	8	0.04308		
	Total	1.44415	11			
Maitama	Model	0.81821	3	0.27274	6.74	0.0140
	Residual	0.32367	8	0.04046		
	Total	1.14188	11			
Utako	Model	0.51390	3	0.17130	7.98	0.0086
	Residual	0.17166	8	0.02146		
	Total	0.68556	11			

CONCLUSION

Based on single - equation regression analysis, the office rent model developed accounted for 76%, 72% and 75% of the variation in office property rents in the commercial property market in Asokoro, Maitama and Utako districts respectively. The study also revealed that real GDP growth and vacancy rate are the major determinants of rental growth in the office property market in Asokoro and Maitama districts while real GDP growth is the major driver of office rents in Utako district. It is hoped that this study will generate greater interest among real estate academics and practitioners in Nigeria to undertake further research on the dynamics of commercial property markets in other cities in the country. Such studies should focus on the relationship between commercial property rental dynamics and commercial property price adjustments and the implication of such relationship on commercial property investment in the country. In addition, knowledge of the key drivers of commercial property rental change in any city in Nigeria is necessary to enable national and international investors make informed decisions on their commercial property investments in such city. This requires consistent and reliable commercial property market analysis to obtain up-to-date indicators that influence rental movements in the property market in such city at any given time. In order to achieve this, the Federal Government through the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS) should ensure that statistics on macroeconomic indicators for the country such as real GDP, unemployment rate, employment rate, interest rate, inflation rate, etc are published on state and city basis. This will enhance the determination of key drivers of commercial property rental change which are reliable and can interpret the reality of the commercial property markets in such locations. Macroeconomic indicators obtained on state and city basis will show the variation in economic fundamentals of those states and cities and will be very useful in analysing the commercial property markets in such locations due to their heterogeneity. At present, macroeconomic indicators for Nigeria published by the CBN and NBS are aggregated for the whole nation and this does not reflect differences in the economic potentials of the states as the same interest rate, inflation rate and real GDP growth are used for all the states in the country.

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